

## MULTIPLE STYLOPISATION OF A PAPER WASP, *ROPALIDIA ROMANDI* (LE GUILLOU) (HYMENOPTERA: VESPIDAE)

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### Notes

Figure 1 shows a vespid wasp, *Ropalidia romandi* (Le Guillou, 1841) bearing three extruded, parasitic stylopids (Strepsiptera: Stylopidae). It is not absolutely clear from the photograph if these are all adult females or include male pupae, although given the host's behaviour it seems most likely that at least one female is present. The photograph was taken on 8 February 2010 in Southport, Queensland. The wasp was behaving strangely, crawling to the top of a blade of grass, falling off and then climbing another one. It is possible the female parasites manipulate the host's behaviour so that it climbs to a good position to encounter males.

Strepsipterans are rarely seen and enigmatic. In nearly all the female is a permanent endoparasite of the host, which, depending on the species, may belong to one of several orders. Unlike most insect parasitoids, strepsipterans do not kill their host at pupation and some species actually prolong their host's life relative to the unparasitised condition (Kathirithamby 1991).



Fig. 1. *Ropalidia romandi* bearing three stylopid strepsipterans extruded through intersegmental membranes (Photo: Casey R. Hall).

The male is a small, winged insect with greatly reduced forewings and flying hind wings, while in nearly all species the female is a reduced simplified permanent endoparasite in the abdomen of the host, occupying up to 80% of the abdomen's volume. Stylopisation renders the host sterile in most cases and changes in the host morphology, cuticle and behaviour are seen (Kathirithamby 1991). The male lives only a few hours after emergence from his host, eats nothing and mating takes place on the female's host (Pohl and Beutel 2008). Eggs hatch within the mother and the female then produces thousands or even millions of tiny active triungulin larvae (Pohl and Beutel 2008). These seek out suitable hosts and dissolve their way through its cuticle, commencing their parasitic lifestyle in a sac produced from host tissues which apparently protects the parasite from cellular defences by the host (Kathirithamby *et al.* 2003).

These very highly specialised parasites are so unlike other insects that their placement within the Insecta is still unresolved (Pohl and Beutel 2008). They have been hypothesised to be a family within the beetles, a separate order closely related to the beetles, an order close to the Diptera, and, given that the larvae of males have external wingbuds, not even included in the Endopterygota (Whiting 1998). Molecular biology work seems to be making some progress on "the Strepsiptera problem", as it is referred to in the literature, and a view is developing that these strange insects lie near the Diptera (Whiting *et al.* 1997, Wheeler *et al.* 2001), which is not inconsistent with their life-history, and some of their morphology and anatomy.

## References

KATHIRITHAMBY, J. 1991. Strepsiptera. In *Insects of Australia: a Textbook for Students and Research Workers*. 2<sup>nd</sup> Edn pp 684-695. Melbourne University Press ISBN 0 522 84454 5.

KATHIRITHAMBY, J., ROSS, L.D. AND JOHNSON, S.J. 2003. Masquerading as self? Endoparasitic Strepsiptera enclose themselves in host-derived epidermal "bag". *Proceedings of the National Academy of Science* **100**: 7655-7659.

POHL, H. AND BEUTEL, R.G. 2008. The evolution of Strepsiptera (Hexapoda). *Zoology* **111**: 318-338.

WHEELER, W.C., WHITING, M.F., WHEELER, Q.D. AND CARPENTER, J.M. 2001. The cladistics of the extant hexapod orders. *Cladistics* **17**: 113-169.

WHITING, M.F. 1998. Phylogenetic position of the Strepsiptera: Review of molecular and morphological evidence. *International Journal of Morphology and Embryology* **27**: 53-60.

WHITING, M.F., CARPENTER, J.C., WHEELER, Q.D. AND WHEELER, W.C. 1997. The Strepsiptera problem: phylogeny of the holometabolous insect orders inferred from 18S and 28S ribosomal DNA sequences and morphology. *Systematic Biology* **46**: 1-68.